294-6 Assessment of Soil Humification Under Conventional and No-till Systems Through Laser-Induced Fluorescence and FT-IR Spectroscopies.

Florent e. Tivet, PERSYST, UR SIA, CIRAD, Montpellier, France, João Carlos de Moraes Sá, Departamento de Ciencia do Solo e Engenharia Agricola, Universidade Estadual de Ponta Grossa, Ponta Grossa, Brazil, Rattan Lal, School of Environment and Natural Resources - The Ohio State University, Carbon Management and Sequestration Center, Columbus, OH, Debora Milori, Agricultural Instrumentation Centre, EMBRAPA, São Carlos, Brazil and Clever Briedis, Av. Carlos Cavalcanti, 4748, Universidade Estadual de Ponta Grossa, Ponta Grossa, PR, BRAZIL

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Abstract
Data on humification is important to assessing the rate and magnitude of soil carbon (C) sequestration. Thus, this study assessed the humification degree (HLIF) of soil organic matter (SOM) and the changes in functional C groups (aromatic-C and aliphatic-C) for contrasting land use and management practices (native vegetation (NV), conventional plow-based tillage (CT) and no-till (NT) systems) in sub-tropical and tropical Brazilian environments. Experiments were conducted at two sites; one each at Ponta Grossa (PG) in the Paraná State and Lucas do Rio Verde (LRV) in Mato Grosso State of Brazil. Two analytical methods, Laser-Induced Fluorescence (LIF) and Fourier-Transform Infrared (FTIR) spectroscopies, were used on whole soil samples to 1m depth (for different depth increments of 0-5, 5-10, 10-20, 20-40, 40-60, 60-80 and 80-100 cm), and on seven aggregate size classes obtained by the wet sieving procedure for 0-5 and 5-10 cm depths. Three functional C groups were selected based on FTIR: aliphatic-C1 (1404 cm-1), aromatic-C (1632 cm-1), and aliphatic-C2 (2852 and 2922 cm-1). Conversion of NV to CT resulted in an annual C loss of 0.28 g kg-1 at PG and 0.29 g kg-1 at LRV in the 0-20 cm depth. In contrast, conversion of CT to NT sequestered +0.29 g kg-1 yr-1 at PG, and with a range of +0.24 to +0.61 g kg-1 yr-1 at LRV depending on the annual biomass input in the NT systems. The HLIF was 3 to 5 times larger at LRV than at PG in all soil depths, indicating that selective preservation by aromaticity of SOM is the predominant mechanism in this environment. Relatively lower HFIL was observed in NT soils at both locations because of the physical mechanisms (i.e., aggregation) which protect most labile moieties. The depletion of C concentration in CT was related to the decrease in functional C groups (i.e., aromatic-C and aliphatic-C) and an overall increase in the humification degree (especially in the surface layer) indicating that physical protection mechanisms are inadequate to protect the labile fractions of OM. In contrast, intensity of functional C groups in NT systems was similar to or even higher than that in the soil under the NV at both locations. A discriminant analysis of principal components was done by using the relative FTIR absorbance of functional C groups, concentrations of TOC and HLIF to assess the loading of each variable in differentiating land use and management practices. This analysis clearly showed that soils of both locations can be clustered into three groups, corresponding to the three main land-use and management practices. Thus, soils under NV, NTs, and CT differed significantly in terms of the composition of organic compounds, and the interactions between inorganic and organic fractions. The data support the conclusion that land use changes modify the arrangement in organic compounds necessitating the diversification of agroecosystems and conversion to NT farming.

Keywords: soil organic carbon, functional carbon groups, soil depth, aggregate, no-till, biomass input